

REMARKS

35 USC §102 and 35 USC §103 Rejections

Claims 57 and 63 have been rejected under 35 USC §102(b) as being anticipated by Kennedy (US Patent No. 3,778,685).

Claims 71-72, 74 and 77 have been rejected under 35 USC §102(b) as being anticipated by Fierkens (US Patent No. 4,250,347).

Claims 71, 73 and 75-76 have been rejected under 35 USC §102(e) as being anticipated by Inaba (US Patent No. 6,093,958).

Claims 58, 60-61, 64, 65-70 and 78-82 have been rejected under 35 USC §103(a) as being unpatentable over Kennedy (US Patent No. 3,778,685) in view of Ishikawa et al. (US Patent No. 5,394,014).

Claim 62 has been rejected under 35 USC §103(a) as being unpatentable over Kennedy (US Patent No. 3,778,685) in view of Inaba (US Patent No. 6,093,958).

Summary Of The Invention

Claims 57-58, 60-70 and 78-82 are directed to the package 16 shown in Figure 2E. The package 16 includes a die 32, a lead frame 28 attached to the die 32, and a plastic body 18 encapsulating the die 32 and the lead frame 28. The package 16 also includes a first polymer member (inner member 42) encapsulating the die 32, and a second polymer member (outer member 44) encapsulating the first polymer member (inner member 42).

In an alternate embodiment claimed in claims 71-77 a package 16A (Figure 5) includes a plurality of polymer members (volume equalizing members 66) having a volume

selected to equalize the volume of molding compound on either side of the leadframe 28A.

Argument

The claims have been amended to include recitations which further distinguish the invention from the prior art. In particular, each of the independent claims includes additional recitations which are not disclosed or suggested by Kennedy, Fierkens, Inaba, or Ishikawa et al., taken alone or in combination.

35 USC §102(b) Rejections Of Claims 57 And 63 Over Kennedy

Independent claim 57 has been amended to include the recitation of the first polymer member "comprising a molded material and at least one filler". Antecedent basis for the "molded material" recitation is contained on page 6, line 8-9 of the specification. Antecedent basis for the "filler" recitation is contained on page 13, lines 15-20 of the specification. Independent claim 57 also recites that "the first polymer member, the molded material and the filler are configured to reduce thermo-mechanical stresses in the package". Antecedent basis for this recitation is contained on page 6, lines 15-18 of the specification.

In Kennedy a "rubbery potting compound 13" is formed around the chip 12. However, the "rubbery potting compound 13" does not have the same structure or function as the presently claimed first polymer member (inner member 42-Figure 2E). In particular, the presently claimed first polymer member comprises a "molded material" whereas the "rubbery potting compound 13" in Kennedy is applied as a drop of material (column 3, lines 59-60). With a molded material as presently claimed, the geometry and dimensions

of the first polymer material can be controlled to achieve volume equalization and reduced thermo-mechanical stresses in the package. In Kennedy the geometry and dimensions of the "rubbery potting compound 13" cannot be as accurately controlled. Further, the rubbery potting compound 13 is not configured to achieve volume equalization, as the molded cover 14 appears to have unequal volumes of material on either side of the leadframe 15. Accordingly, accurate volume and dimensional control of the rubber potting compound 13 do not appear to be a significant issue, as with the present first polymer member.

In addition, the filler in the present first polymer member provides "desired mechanical and electrical characteristics such as a relatively fast cure time and an increased rigidity" (page 13, lines 18-20 of the specification). These characteristics help to perform the stated function of "reduced thermo-mechanical stresses". In Kennedy, there is no suggestion of using a filler in the "rubbery potting compound 13" to achieve the function of reduced thermo-mechanical stresses. Rather, Kennedy teaches compressibility of the "rubber potting compound 13" to reduce damage to the chip 12 (column 3, lines 17-19). Although fillers are known in the art as exemplified by Ishikawa et al., they have not been heretofore used in the presently claimed structure of a molded inner member configured to achieve the stated function of reduced thermo-mechanical stresses.

Claim 63 has been amended to state "the die includes wire bonds and the first polymer member encapsulates the wire bonds". Antecedent basis for this recitation is contained on page 10, lines 32-34 of the specification. In Kennedy there are no wire bonds, and no teaching of

encapsulating wire bonds in a molded first polymer member configured to reduce thermo-mechanical stresses.

In view of these differences, amended claims 57 and 63 are submitted to be both novel and unobvious over Kennedy.

35 USC §102(b) Rejections Of Claims 71-72, 74 and 77 Over Fierkens

Fierkens discloses a method of encapsulating microelectronic elements in which a lower mould half 8 and an upper mold half 11 are used to mold an encapsulating material 16, and then become part of a permanent enclosure for a crystal 15. However, the encapsulating material 16 in Fierkens has a different structure and function than the "polymer members" 66 (Figure 5) of the package 16A (Figure 5) of claim 71.

As shown in Figure 5 of the present application, the polymer members 66 are located on opposing sides of the die 32. Independent claim 71 has been amended to recite "a plurality of polymer members". Antecedent basis for this recitation is contained in Figure 5. In addition, independent claim 71 recites that the polymer members 66 are configured "to equalize" a volume of the molding component in the upper portion 18AU and the lower portion 18AL of the package body 18A. Further, independent claim 71 has been amended to state that the polymer members 66 are configured "to reduce thermo-mechanical stresses in the package during molding of the plastic body". Antecedent basis for this recitation is contained on page 15, lines 4-6 of the specification.

In Fierkens the mould halves 8, 11 comprise a pre-formed hardened plastic which is used to mold the encapsulating material 16. The encapsulating material 16 therefore cannot be configured to perform the stated

function of the present polymer members of equalizing volumes and reducing thermo-stresses during molding of the mould halves 8, 11.

In addition, the features of a filler in the polymer members (amended claim 74), the locations of the polymer members (amended claim 75), and the shape of the polymer members (amended claim 76), are not disclosed or suggested by Fierkens.

In view of these differences claims 71-72, 74 and 77 are submitted to be both novel and unobvious over Fierkens.

35 USC §102(e) Rejections Of Claims 71, 73 and 75-76 Over Inaba

Inaba discloses a semiconductor device having thin plates 9 configured to reduce the region R where the thicknesses T1 and T2 of the sealing resin layer 6 are unbalanced. However, there are not equal volumes of molding compound on either side of the leadframe, as presently claimed, because the regions R still exists. In other words Inaba teaches thickness equalization, rather than volume equalization as presently claimed. The Inaba plates prevent formation of "a winding void on the upper surface of the semiconductor element 1B as illustrated in Fig. 6" (column 3, lines 39-41).

35 USC §103(a) Rejections Of Claims 58, 60-61, 64, 65-70 and 78-82 Over Kennedy in view of Ishikawa et al.

As previously argued, Kennedy does not teach or suggest volume equalization, and thermo-mechanical stress reduction, using a molded first polymer member, as claimed in amended independent claims 57, 65 and 71. Ishikawa et al. also does not teach or suggest this feature. In the device 30 shown in Figure 4 of Ishikawa et al. a resin

package 1 is covered by a film 31. The film 31 "has a refractive index which is different from that of the resin package 1, to effectively prevent penetration of light" (column 5, lines 33-35). The film 31 is formed by dipping (column 5, lines 32-33), such that the generation of thermal stresses during molding is not an issue. Further, the film 31 is not a plastic body as claimed in amended independent claim 57 and 71, and is not a rigid molded material as claimed in amended independent claim 65.

In addition, the combination of Kennedy and Ishikawa et al. does not teach or suggest the use of a filler in a molded inner member, which functions as claimed in amended independent claims 57 and 78 to reduce thermo-mechanical stresses. Although the resin package 1 in Ishikawa et al. discloses a filler (column 5, lines 3-6), the filler appears to perform the function of light absorption (column 4, lines 61-65). In contrast, the filler in the present component contributes to the stated function of the polymer member in reducing thermo-mechanical stresses. As previously argued, although fillers are well known in the art, they have not been heretofore used in a polymer inner member configured to reduce thermo-mechanical stresses in a package.

35 USC §103(a) Rejection Of Claim 62 Over Kennedy in view of Inaba

Claim 62 had originally stated the first polymer member comprises "a tape material." Inaba was cited as disclosing a tape material 4 on plates 9. However, independent claim 57 has been amended to state the first polymer material comprises "a molded material and a filler". To be consistent with this recitation dependent

claim 62 has been amended to remove the "tape material" recitation.

Conclusion

In view of the amendments and arguments, favorable consideration and allowance of claims 57-58 and 60-82 is respectfully requested. Should any issues arise that will advance this case to allowance, the Examiner is asked to contact the undersigned by telephone.

DATED this 1st of October, 2004.

Respectfully submitted:



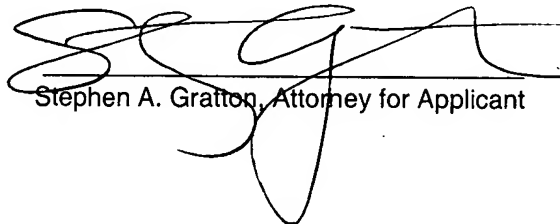
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